Tipularia

A BOTANICAL MAGAZINE

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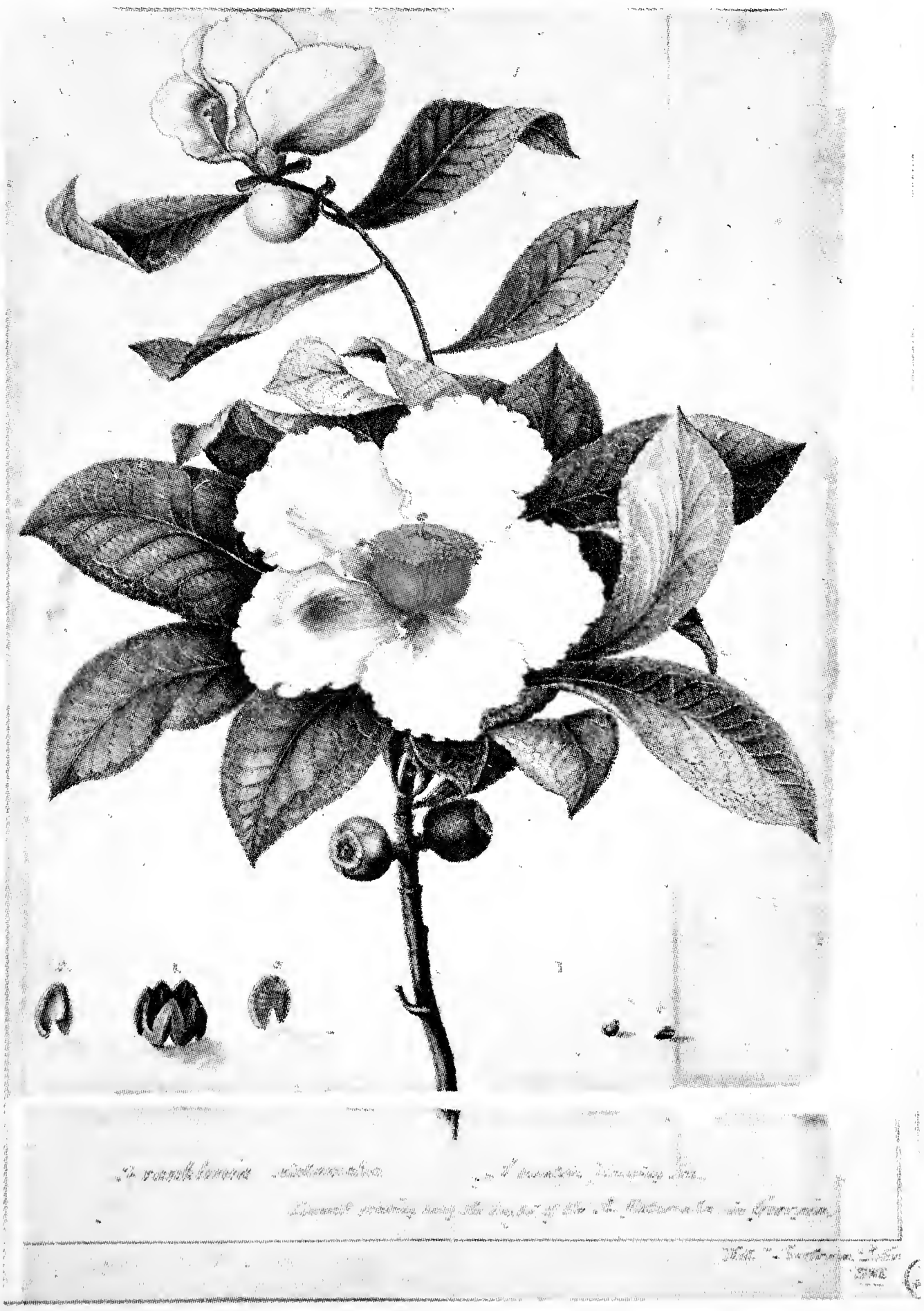

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Byliners

Bill Close studied at the Corcoran Gallery School of Art, Washington, D.C., and was Advertising Art Director for Rhodes, Inc., for 27 years. He is a regular contributor to *Tipularia.*

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Carol Howel is a biologist for Garrow and Garrow, Inc., an environmental consulting firm, which takes her on active pursuit of rare plant habitats in Georgia and elsewhere.

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Scott Ranger is president of the Georgia Botanical Society, an avid amateur botanist and a regular contributor to Tipularia.

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Lloyd Synder, retired manager of Cokesbury Book Store, is co-author with James Bruce of *Field Guide to the Ferns and Other Pteridophytes of Georgia.*

Richard Ware is an enthusiastic amateur botanist and photographer with a special interest in woody plants and the flora of Floyd County.

Sharon Worsham is the new editor for *Tipularia.* A former teacher, she is a commercial graphic artist producing environmental education materials and exhibits. She was managing editor of *Georgia: Images of Wildness* (to be released in September).

Membership

The Georgia Botanical Society is open to all persons interested in the botany of Georgia. Annual dues: individual or family, $15; group, $20; student, $5. Send mailing address and check payable to the Georgia Botanical Society to Suzanne S. Jackson, treasurer, 3461 Ashwood Lane, Chamblee, GA 30341. Members receive *Tipularia* without extra charge. Persons wishing only to receive the magazine may become *Tipularia* associates for $7 a year. Single copies (when available), $4.

Editorial information

Tipularia strives to combine the scientific authority of a botanical journal with the readability of a magazine. Some articles are assigned; unsolicited manuscripts are welcomed for consideration. *Tipularia* is unable to pay for articles or art, but there is no charge for publication of them.

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Billy Bartram: A Life

By Eve Richardson

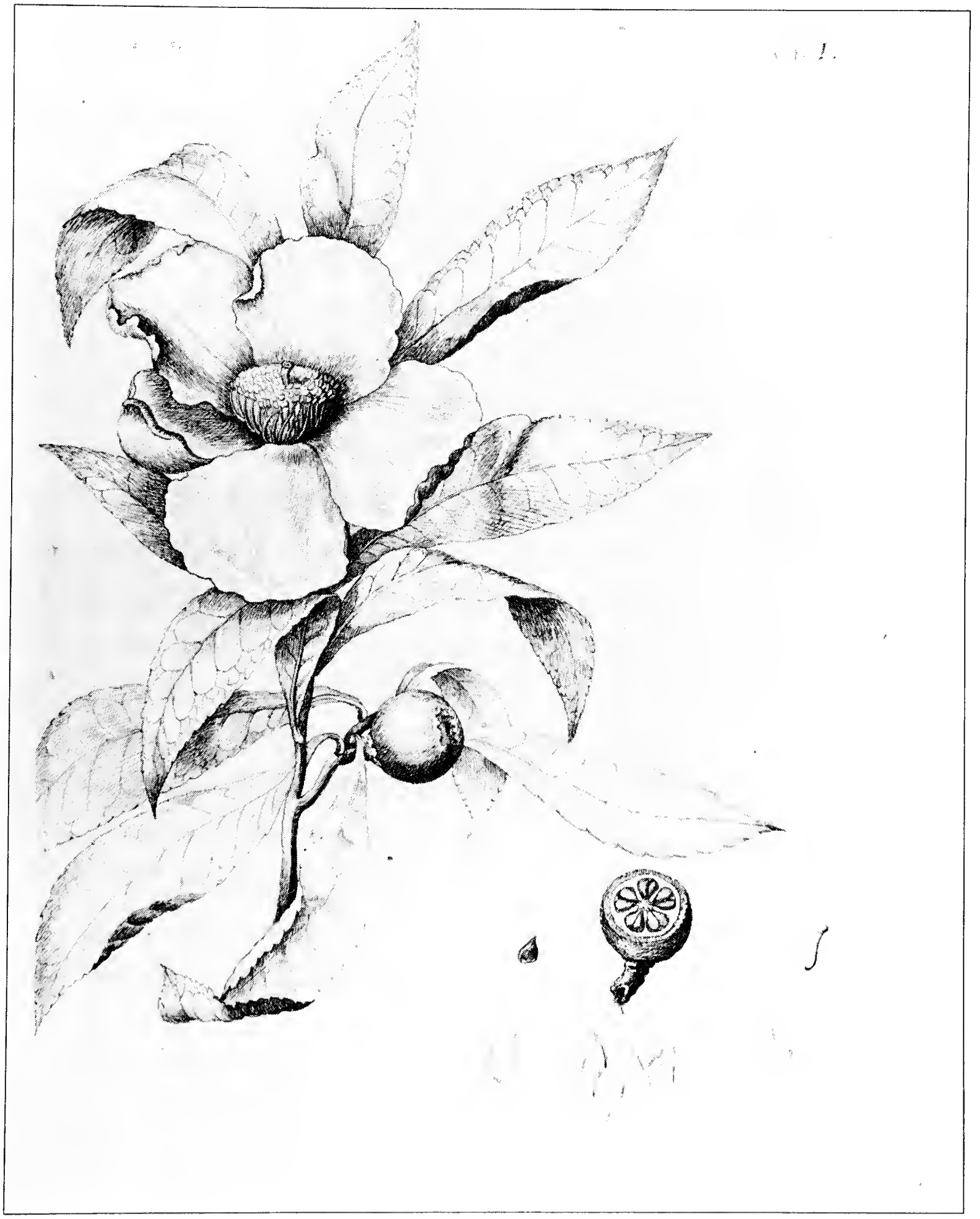
"Nature and the art that copies her have nothing to say to a man who is stupid or cold," wrote Denis Diderot in the eighteenth century, and certainly William Bartram's sketches and drawings reflect a man who was neither. Bartram was an artist for whom Nature became both ground and figure.

A gentle, liminal soul with one foot in the Age of Romanticism and the other in the Age of Sensibility, Bartram fed his work from both. His book enjoys the grand title, *Travels Through North and South Carolina, Georgia, East and West Florida, the Cherokee Country, the Extensive Territories of the Muscogulges, or Creek Confederacy, and the Country of the Choctaws; Containing An Account of the Soil and Natural Productions of Those Regions, Together With Observations on the Manners of the Indians*, but his drawings are marvels of delicacy. Their refinement reflects Bartram's keen and careful eye, their spareness is redolent of his Quaker rearing.

Among the many Quakers who, fleeing persecution in England, paid William Penn forty shillings for one hundred acres of New World land were John and Elizabeth Bartram. They endured the arduous sea voyage to settle west of Philadelphia, and their great-grandson would be William.

Born in 1739, the seventh of nine children of John and Ann Mendenhall Bartram, William grew from a dreamy child into a dreamy young man who, like many another artist, perplexed his father. The industrious John was a botanist, self-taught but already attracting considerable professional recognition. Labelled "the greatest natural botanist in the world" by Carolus Linnaeus (Carl von Linne), the Swedish botanist known for his system of classifying plants, John would in 1765 be named the official Colonial Botanist to George III of England.

In part because Billy was the son most interested in plants, but in part because John couldn't decide quite what to do about the boy, he often took young Billy along on his botanical exploration trips. In 1765 (in some accounts, 1777), on a journey through Georgia, the two first identified the plant which they never saw "...growing wild but in one spot on the Alatamaha [a misspelling of the Georgia river Altamaha] about 30 miles from the sea coast..," and which William later described in his journal as "...a



Franklinia alatamaha ***which Bartram described in his journal as "...a flowering tree, of the first order for beauty and fragrance of blossoms" is named in honor of the river on whose banks it grew, and of John's friend Benjamin Franklin.***

flowering tree, of the first order for beauty and fragrance of blossoms." Named in honor of the river on whose banks it grew, and of John's friend Benjamin Franklin, *Franklinia alatamaha* no longer grows in the wild, although cultivated it appears in gardens, including the present Bartram's Garden in Pennsylvania.

In a 1933 article in *The Pennsylvania Magazine of History and Biography*, Charles Jenkins writes, "It is the twelfth of November and near the top of [my] Franklin's tree, the size and shape of overgrown pearls, are five unopened buds that surely will be caught by the killing frost.... Since the first of August the tree has been in constant bloom and like the venerable philosopher, whose growing namesake it is, *Franklinia alatamaha* is giving of its beneficence as did he .... No tree...has a more romantic history. For one hundred and forty years botanists have sought to find it growing in its native habitat by the Georgia river.... Nowhere along the banks of this muddy stream, or elsewhere in the state of Georgia, or in the northern hemisphere, or in the whole wide world have eager searchers found it growing in its natural state. Every specimen of Franklin's tree now known in this country is descended from the seeds of the little plant carried...from the banks of the Altamaha to those of the Schuylkill in an overloaded saddle bag." (European botanists, assuming *Franklinia alatamaha* to be of the genus *Gordonia*, had early labelled it *Gordonia pubescens*. In 1785 its proper name first appeared in print, and in the 1930's Dr. Frederick V. Coville of the United States Department of Agriculture declared *Franklinia* to be a distinct genus, saying its seeds are sufficiently different from those of *Gordonia* that no question remains.)

Billy's love of nature and his artistic bent must have delighted his father.

What a joy it must have been for John to share this find with his young son, who even then would have appreciated it. And yet John was of two minds about the problematical Billy. John's own botanical drawings were well-regarded by the cognoscenti, who certainly would not have offered false praise, and so Billy's love of nature, his fine eye, and his artistic bent must have delighted his father. On the other hand, life was hard and one must earn a living, which John feared the boy's gifts would ill afford him. This son who most shared his passions was also the one who most unsettled him.

To Peter Collinson in England, for whom he collected seeds and plants, John wrote, "My son William is just turned of 16. It is now time to propose some way for him to get his living by.... I am afraid that botany and drawing

will not afford him one, and hard labor don't agree with him."

John's friend Benjamin Franklin offered to teach Billy engraving and printing, but John demurred, saying Franklin was the only person he knew of who managed to make a living at it. Dr. Alexander Garden volunteered to teach Billy medicine, but John complained that only the botanical aspects of medicine interested the boy. (A recent find in Bartram family papers is a set of finely-crafted surgical drawings previously thought to be the work of John Bartram's brother William, but now believed to have been executed by Billy.)

Ultimately, perhaps in desperation, at eighteen Billy was placed with the Philadelphia storekeeper James Child. But four years of that — even punctuated with botanical trips — and Billy was ready to quit both the job and Philadelphia.

John, on a visit to his brother William on the Cape Fear River in Carolina, had learned that William had had similar concerns about his own son Bill. The brothers made a pact: William's Bill would come to Philadelphia to study medicine at the Academy, young Billy would try his hand at storekeeping in Carolina, and each brother would keep an eye on the other's son. Which is how Billy came to be a storekeeper in Carolina.

Around this time, Peter Collinson had persuaded King George III to name John Bartram his "Colonial Botanist," and the attached stipend (fifty pounds annually) enabled John to set sail for Charleston. He stopped in Carolina for Billy (who probably required no persuasion), and father and son set off overland from Charleston to St. Augustine and explored the St. John's River by canoe — John collecting specimens, Billy sketching trees, birds, fish, plants, and animals. When John returned home, Billy, who had decided he wanted to be a planter, stayed behind on the St. John's River. The plantation venture failed, and a difficult year later Billy returned to the family farm at Kingsessing.

It is easy to imagine that on the long journey home he might have felt dejected, unaware that his life was about to change dramatically. No less than any man a product of his time and place, he had the curiosity and the thirst for information which were then abroad in Philadelphia. For a man with an inquisitive mind, this was a glorious time and place to be alive; for one who had a scientific bent, doubly so. And what a time for botanists! Interest in gardening, particularly in the plants of America, was burgeoning in Europe, and Billy's father's travels, along with his unflagging work and assiduous study, had carried abroad John's name and that of Bartram's Garden. Those who visited and corresponded with Billy's father included the great men of the plant world, to whose minds and personalities Billy would of course have been introduced. He was not one on whom the opportunity would be wasted.

For a man with an inquisitive mind, this was a glorious time and place to be alive.

Meanwhile, John had sent the

drawings Billy had made on the Florida journey to his friend and associate Peter Collinson in England, and the pleased Collinson passed them on to Dr. John Fothergill. Soon came word that Fothergill wished to become Billy's patron, underwriting his travels and introducing his work to others in England — including the Duchess of Portland, an avid collector whose estate near Liverpool, Knowsley Hall, yet contains many Bartram memorabilia.

Billy's passion had finally found its proper channel, and he had found his vocation. Beginning in 1773, he would disappear into the trackless brush, surfacing from time to time to write to his father or to send Fothergill sketches, journals and specimens. The specimens rarely reached their destination, but astonishingly, his drawings and many of his journals did. Of his drawings and papers not in private collections today, most are in the British Museum of Natural History in London; some are among the holdings, in Philadelphia, of the American Philosophical Society, one of whose charter members, in 1743, was John Bartram, and to whose membership Billy would be elected in 1786.

Billy's Rousseau-like respect for nature and his rapport with Indians were almost mystical, and on more than one occasion this gentle man, dressed always in leather from head to foot, escaped unharmed from apparently desperate situations. Apolitical, immersed in his work, Billy little knew that beyond his wilderness raged a war for independence.

Returning home, finally, to Kingsessing in 1778, Billy found his father several months dead and Bartram's Garden tended by his brother John. Life changed dramatically for Billy. If the American war for independence had little affected his work, it had managed to sever most of his English connections; too, his health had deteriorated. The time for traveling was over. Billy's brother John made him a partner in Bartram's Garden, which they operated as a commercial nursery, and Billy settled in at the farm with John and his family, eventually taking on his father's mantle of resident sage. Billy died in 1823.

Though Billy never officially abandoned the Society of Friends, as time passed he drifted into pantheistic deism — no surprise, given his questioning mind and his ardor for the outdoors. Occasionally he accepted commissions to illustrate botanical books, but chiefly he devoted himself to editing his journals. In 1782 he declined an offer to teach botany at the University of Pennsylvania, claiming poor health, though it is likely his shyness and lack of formal schooling shaped that decision — a sad waste of resources, as this unusual man might have left us an even greater legacy than his already considerable one.

Billy's Rousseau-like respect for nature and his rapport with Indians were almost mystical.

For its rhapsodic excess, his lyrical *Travels* at first brought mixed reviews, but within ten years of its appearance in 1791 it would be published in ten European countries. More than one Romantic poet borrowed heavily from

(or, depending upon one's view of authorship, plagiarized) *Travels*, which is today regarded as a seminal work, and is a text in courses on American literature in many colleges.

Bartram's House and Bartram's Garden, now a part of the Philadelphia public parks system and home to the John Bartram Association, thrive as a living monument to John, to Billy, and to the younger John. And winding through the history — indeed through the present streets — of towns, cities and pastoral land in the southeast, the Bartram Trail today traces Billy Bartram's soft, intrepid steps of two centuries ago.

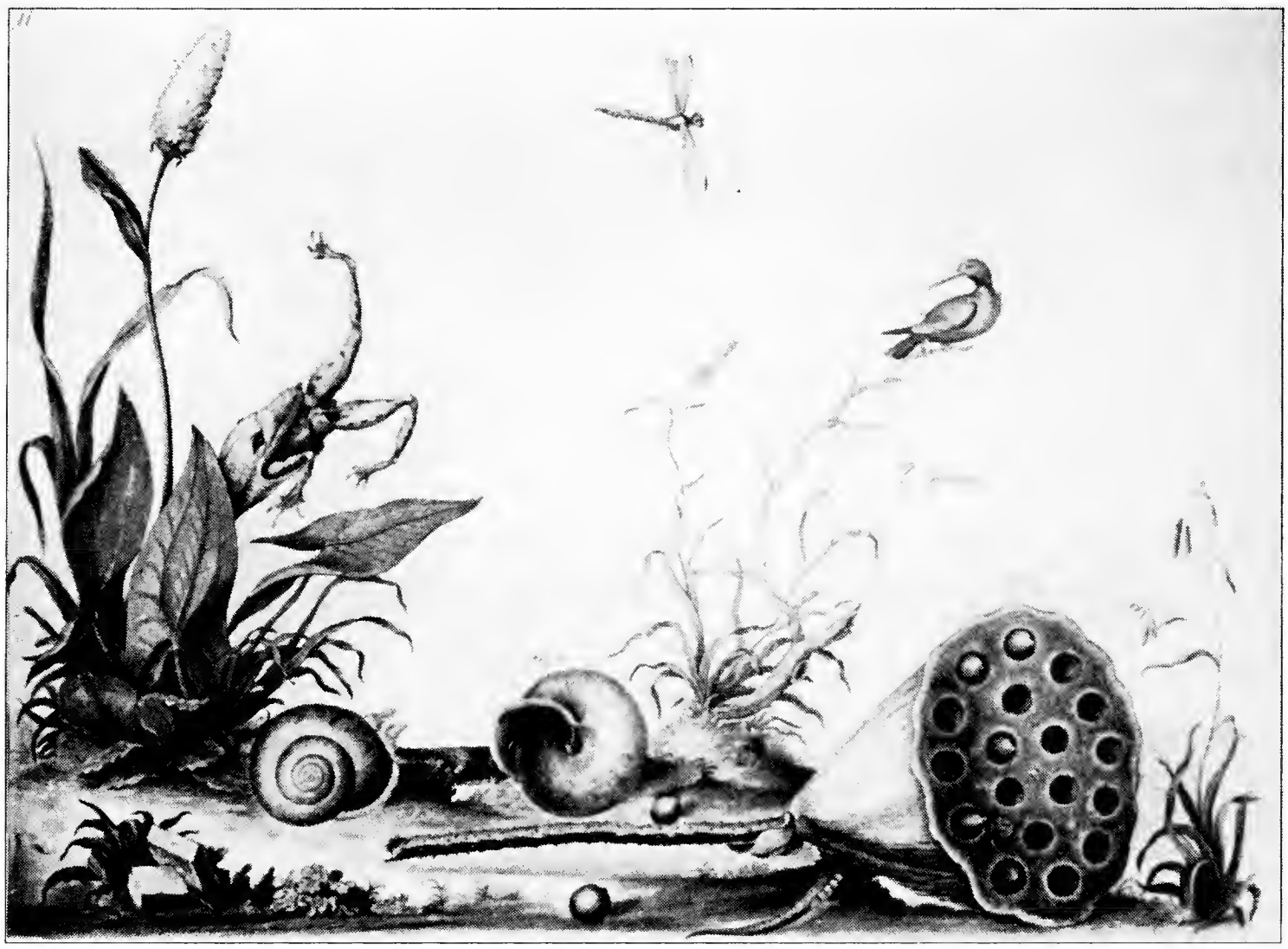
One valuable Bartram legacy is, however, often overlooked. In his later years Billy would become a friend to the frustrated Scots poet Alexander Wilson, who taught school at Gray's Ferry near the Farm. Bartram unwittingly influenced Wilson's significant work, *American Ornithology*, for it was from Bartram and his catalogue of fifteen hundred birds that Wilson learned to sketch. Years later, a grateful Wilson would name the "Bartram's Sandpiper" bird (upland plover, or *Bartramia longicauda*) in honor of his mentor.

Ironically, no plant bears the name of Billy Bartram, a void which oddly befits the enigma his personal life remains. But this American artist, writer, and scientist — in the best sense a man of his time — is well memorialized in his manifold and diverse gifts to us, by which we are the richer.

[Ed. Note: See also *Tipularia*, November 1986, *This very curious tree*, by Bozeman and Rogers; and Spring 1989, *Through the eyes of William Bartram*, by Mellinger].

William Bartram's Sketches:
The Field and the Image

By James Rosen



At the outset we acknowledge Dr. Charlotte Porter, who, in some of the finest writings on nature and art, gives one an understanding of the visual needs William Bartram had, and of his various solutions for them. In her article, "The Drawings of William Bartram, American Naturalist" (Archives of Natural History, 1989), Porter writes of how Bartram "viewed oriental works of art for information about natural history...;" how he had access to the work of Carolus Linnaeus (Carl von Linne), the Swedish botanist known for his system of taxonomic classification; how "publication, particularly the process of engraving, developed Bartram's spatial placement and composition."

Essentially visual, Bartram would have responded eagerly to, would have taken in and distilled any visual matter that came his way. It is hard to imagine that the detailed scientific illustrations in early encyclopedias such as Denis Diderot's *Encyclopedia*, completed in 1772 containing 3000-4000 plates, would have escaped his incisive eye.

Porter writes, "Bartram's visual isolation and masterful balance of negative space are the hallmarks of the French school of Pierre-Joseph Redoute [the most famous botanical artist of his day, 1759-1840]."
"Bartram," Porter reminds us, "sees the landscape uninhabited by mathematical perspective....To his way of seeing, nature observed was nature composed. The mind's eye provided a framework, and in his drawings Bartram omitted the linear margins [rectangular lines enclosing the image] which conventionally bounded the illustrated page in natural history books of the period."

The microscope had created a new world of vision and revolutionized the illustrating of dictionaries and encyclopedias. Encyclopedia engravings and the microscope must have influenced Bartram's visual perception and the way in which he laid out an image across the page.

Though he omitted the linear margins customary in his day, Bartram as a user of smooth grounds — the page — did not take for granted its regular margins. In nature, there is no field that corresponds to the page. A page is smooth, and bounded on four sides with right angles. Bartram did not merely make use of the rectangular form of a sheet of paper; he loved it, as an indispensable means toward an end.

Central to William Bartram's watercolors and drawings is the *image field*. An image is the whole of what one sees; an image field is a bounded surface. Perceiving the image field, then, is the perception of a picture — a "looking-at" the qualities of surface space (that which can be rendered onto a flat surface), as distinguished from the viewing of one's 3-dimensional world — a "seeing-into" physically-negotiable space, the space one sees to walk through. One cannot walk into an image field (a picture) without putting a foot through it, thus destroying it as an image.

The discussion that follows owes its framework to Professor Meyer Schapiro's seminal essay "On Some Problems in the Semiotics of Visual Art: Field and Vehicle in Image-Signs." Bartram was no cave painter, no creator of petroglyphs working on the lumps and bumps of cave walls and stone surfaces; rather, his image field was a smooth, symmetrical ground, a sheet of paper — his inventive imagination giving his painting and drawing a regularity of direction, spacing and grouping. The closed and regular shape of the ground (page) he worked on gave his image a definite space of its own and revealed the harmony of its parts in relation to that space. Also, Bartram

thrived on the element of chance, his appreciation and use of which allowed him to exceed what others achieved by mere calculation.

The properties of the page as an image field, regular and smooth, affect our sense and comprehension of signs (figures): when there is, as in cave paintings for example, no regular boundary of the image field, we tend to center the image in our view. In the bounded image field within which Bartram worked, the center is predetermined by the boundaries of the figure or form, in part by its place in the field. For example, when Bartram draws a flower at the side of the page it has a different quality for us than when he draws it at the center. When a figure stands a little to the side of a "thing-less" or "no-thing" white space, it creates visual tension.

In the image field of Bartram's work we might notice the qualities of upper and lower. We walk on flat earth and this is reinforced by our visual experience of the division of sky and earth (upper and lower), which coincides with the alignment and level of our eyes — made nearly perfect by the image field with its regular boundedness. The difference is not invertible. Just as we do not invert upper and lower in nature, so we do not ordinarily transpose lateral (sideways) groupings. The lateral position of figures in an image field expresses a certain quality that may be lacking when transposed. Bartram saw this difference. In his asymmetrical studies, the choice of one side or the other for the denser or more active part of the image alters the expression or, as Professor Schapiro writes, "the reversal gives a strange aspect to the whole, which may be more than the shock of reversal of a familiar or habitual form." Many good artists are indifferent to reversal when their drawings are made into etchings or engravings. Perhaps in certain contexts Bartram's choice was deliberate: he wanted to make a particular quality visible. As the Swiss painter Paul Klee states, "Art is not rendering what is already visible; art is *making* visible."

In addition, composing an image on the diagonal from lower left to upper right has an ascending quality, while the reverse has a descending quality. When Bartram's forms ascend from lower left to upper right, the image is a playful, easy saunter upwards, but when his forms climb from lower right to upper left, it is a more strained, labored ascent. Indeed, leftward and rightward reversals often trigger expressive responses in both the artist and the observer.

The characteristics of an image field — surface, boundaries, positions and directions — are powerful, expressive, and non-imitative forces. William Bartram's image field reflects not only his ideas for order and precision but also a model of thought: the concept of a world law-bound in its elementary components, but open, spontaneous and contingent in its wholeness.

Bartram's work fairly breathes spontaneity. He loved painting with watercolor, but he loved best to draw, and in his drawings each component — surface, shape, color — is primarily determined by line. At no loss to energy and freedom, the aesthetic merit of his drawing lies in its delicacy and refinement of detail.

In the planning for 1996 is "The Field and the Image: The Art of William Bartram," the first comprehensive exhibition of Bartram's work, and a rare study of it not as botanical illustration, but as the creation of an artist. His exemplary work in other disciplines has been accorded critical attention these two hundred years, but this exhibition will address what is often overlooked — Bartram's work as image.

We gratefully acknowledge permission of the British Museum (Natural History), London, and the American Philosophical Society to reproduce the illustrations of William Bartram in this issue.

Hybrid Ferns of Georgia

By Lloyd Snyder

Of the 83 species of true ferns that have been found in Georgia, there are 6 fertile species of hybrid origin and 7 sterile hybrids.

Ferns are vascular plants that reproduce by spores, not seeds. Fern spores are minute bodies, smaller than grains of pepper, which are usually black, brown or yellow. They are contained in a case called a **sporangium**. Normally there are 64 spores in a sporangium, although in some species there may be as many as 500 or more. Usually about 50 sporangia are grouped together to form a **sorus**. Sori are usually located on the underside of fertile fronds, and to the uninitiated they are often believed to be some form of insect life or disease harmful to the plant.

The arrangement or pattern of sori is often a clue to the fern genus. Sori may be arranged on or near the leaf margin, scattered over the surface, in a row along the midvein, or on the edges of the leaves. In some cases (*e.g.*, sensitive and cinnamon ferns) the ferns are dimorphic: the fertile leaves being stalk-like with groups of bead- or nut-like sporangia located at the top.

The life cycle of ferns is unusual. When the spores mature, the sporangia burst open, scattering the spores. A germinating spore produces a gametophyte, or **prothallus** — a small, usually green, heart-shaped body about one-quarter inch in diameter attached to the soil by many hairlike rhizoids. The gametophyte bears the sex organs: the female **archegonium** with its single egg and the male **antheridium** with its numerous sperm. The sperm swims to the egg in a film of water and fertilizes it. From this union grows the new fern sporophyte (a plant producing spores).

Lobed Spleenwort

Hybrids are formed when the sperm from the prothallus of one fern species fertilizes the egg in the prothallus of another kind of fern. This, of course, can only happen when the parent ferns are closely related and usually when they are growing near each other.

Ferns, like all plants, are composed of millions of microscopic cells. Each cell contains a number of **chromosomes** which contain the

Fern Species a (2n) AA	X	Fern Species b (2n) BB	→	Sterile Hybrid ab (2n) AB	→ x2	Fertile Species ab (4n) AABB

Fig. 1. Evolutionary process by which a sterile diploid hybrid becomes a fertile tetraploid.

genes, the units of heredity. The number of chromosomes in each species is constant and for most ferns the haploid chromosome number (n) is between 22 and 41, with a majority between 35 and 41. Most members of a genus, and often of a family, have the same count, so that the chromosome number helps in identifying the genus of a fern.

Most ferns are **diploids** — *i.e.*, they have two matching sets of chromosomes, written as 2n. In the sporophyte stage the sporangium has a sporogenous cell which divides several times to make sixteen spore mother cells. Each of these in turn goes through a process known as **meiosis**, a nuclear division, to form four spores. These spores each contain only one set of chromosomes, the **haploid** (n) number.

In the gametophyte or prothallus stage every cell, including the sperm and egg, is haploid (n), with one set of chromosomes. In a normal species these two sets (in the sperm and egg) are combined so that fertilization produces a diploid sporophyte with 2 sets (2n) of like chromosomes. When spores are formed by the 2n sporophyte, the like chromosomes pair up in meiosis, and only 1 of each pair goes to each spore, making the spores and their resulting gametophytes and gametes haploid (n), thus compensating for the doubling effect of fertilization (n+n→2n).

If, however, the sperm and egg from the prothalli of two different species unite, the 2 sets of chromosomes will not be alike. Even just one unmatched chromosome would produce a sterile hybrid, as the chromosomes could not pair up for the reduction division process (meiosis). Such hybrids may be viable, but are sterile, caused by the failure of unmatched chromosomes to pair properly.

Sometimes in the evolutionary process the chromosomes in a sterile diploid hybrid will double. Through the doubling of the chromosome number (a duplication of both sets of chromosomes) the sterile diploid hybrid becomes a fertile **tetraploid** with a 4n chromosome number. This process is illustrated above in Fig. 1.

The tetraploid is fertile because the A chromosomes can pair with the other A chromosomes, while the B chromosomes can pair likewise, so reduction division can proceed, making functional spores.

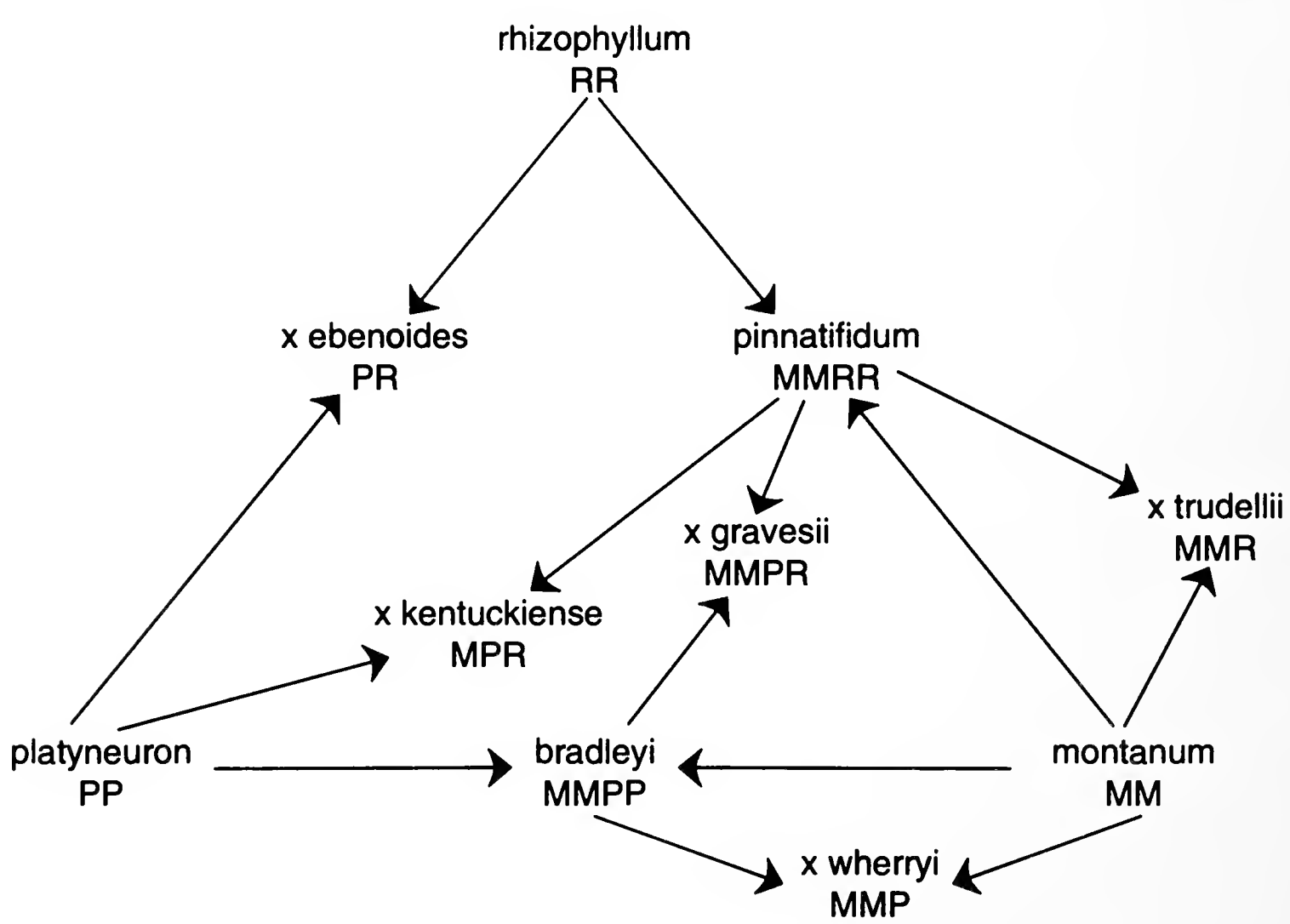
Making a chromosome squash to count chromosomes in a laboratory is a sure way to determine whether a fern is a sterile hybrid, but it is not always possible to recognize a sterile hybrid in the field. There are certain guidelines that will help: (1) The plant may look funny or unusual, not being typical of any species, but having mixed characteristics of two species. (2) There may be one or two unusual plants in a

colony of one or more typical species. (3) The spores are aborted. Viewing this may require magnification of 40x. In normal ferns the spores are all alike. However, in sterile hybrids the spores are irregular in shape and size. In some cases even the sporangia abort. In this case there are no spores at all and the sporangia look solid, like small solid beads.

In Georgia, there are sterile hybrids or fertile ferns of hybrid origin in the genera *Asplenium, Dryopteris,* and *Cystopteris*. (Among the lower pteridophytes, or fern allies, there are also hybrids in the genera *Lycopodium* and *Isoetes*, but that is another story.)

The Appalachian Spleenwort (*Asplenium*) Hybrids

Although in the United States nationwide the wood fern (*Dryopteris*) hybrid complex is the largest, in Georgia the majority of known fern hybrids are in the Appalachian spleenwort (*Asplenium*) complex. These spleenworts grow in moist, shaded rock crevices, outcrops, cliffs and ledges. In 1954 Herb Wagner reported the basic outline of this group. The relationship of the Georgia hybrids can be illustrated by the following chart:



The *Asplenium heterochroum-resiliens* Complex

Wagner's Spleenwort
(*Asplenium heteroresiliens*)

This coastal plain hybrid is found in Georgia in addition to the Appalachian spleenworts. Fronds, 4 to 12 inches long, about 1 inch wide; erect, tufted, evergreen. Stipe and rachis brown to black. Blade broadest above middle. Pinnae triangular-ovate to oblong-ovate. Superior auricles. Lower third of pinnae somewhat descending with small auricles on lower side. Margins variable but usually shallowly cut with coarse teeth.
Pentaploid HHRRR.
Habitat: Rocks, hammocks, calcareous crevices and limestone sinks.
Georgia range: Lee County, Baker County

Tetraploid MMRR.
Georgia range: Chattooga, Dade, Walker, Bartow, Hall, Stephens, Fulton, DeKalb, Walton, Heard, Bibb and Twiggs Counties

Bradley's Spleenwort
(*Asplenium bradleyi*)

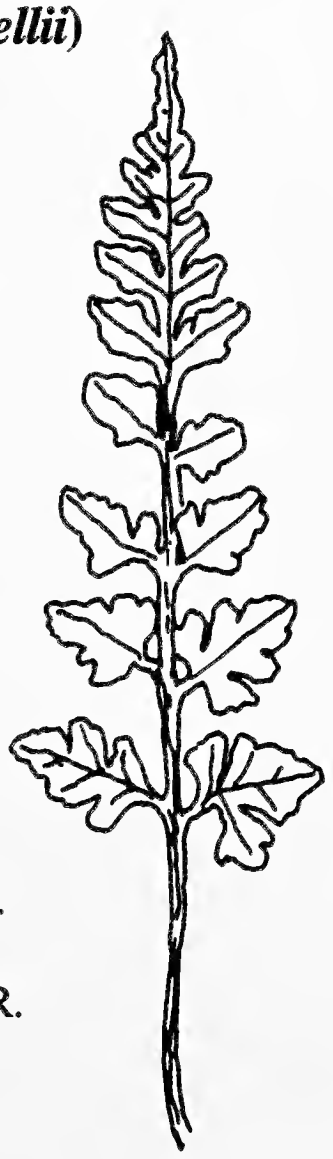
Fronds 3 to 8 inches long, 1/2 to 1 1/2 inches wide; few, tufted, evergreen. Stipe shining dark green; lower rachis dark brown, upper green. Blade oblong-lanceolate to oblong. Pinnate with pinnatifid apex. Pinnae alternate. Basal pinnae triangular becoming oblong-lanceolate to oblong with lobed apex. Superior auricles. Margins serrate to jagged. Tetraploid MMPP.
Georgia range: Chattooga, Dade, Walker, Whitfield, Floyd, Rabun, Stephens, DeKalb, Lincoln, Upson, Washington, and Treutlen Counties

Lobed Spleenwort
(*Asplenium pinnatifidum*)

Fronds 2 to 7 inches long, 1/2 to 1 inch wide; few, clustered, evergreen. Stipe, brown below; green, above. Rachis green and smooth. Blade simple, long, triangular with long, slender tip. Pinnately lobed in rounded segments, variously asymmetrical.

Trudell's Spleenwort
(*Asplenium x trudellii*)

Fronds 2 to 5 inches long, 1/2 inch wide; few, clustered, erect to arching, evergreen. Stipe dark brown lower half, green upper; rachis green. Blade lanceolate to narrowly deltoid with long acuminate apex. Pinnate at base with pinnae widely spaced. Upper part pinnatifid, often deeply lobed. Widest at base. Lower pinnae deltoid-ovate, upper ovate-lanceolate. Margins coarsely toothed. Triploid MMR.
Georgia range: Dade and Fulton Counties

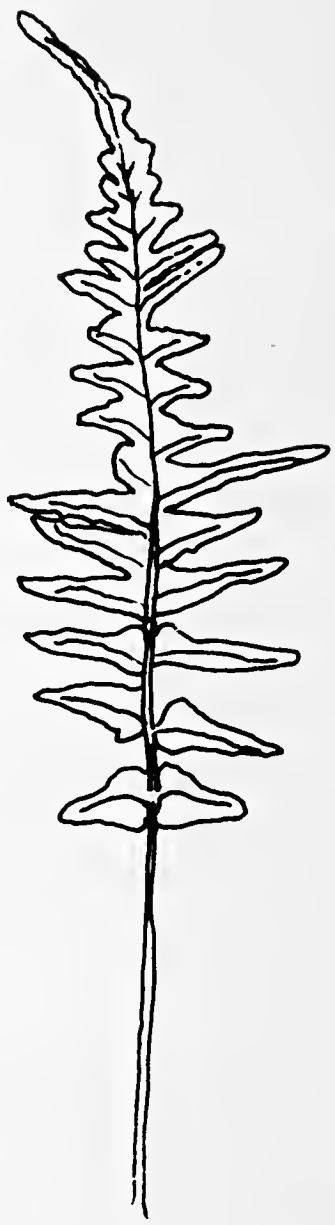


Graves' Spleenwort (*Asplenium x gravesii*)

Fronds 1 to 5 inches long, 1/2 to 1 inch wide; clustered, wide-spreading, evergreen. Stipe brown; rachis brown at base, green above, slightly winged. Blade long and narrow with long tapering tip. Base pinnate, apex pinnatifid. Pinnae ovate to triangular, broadest at base, blunt-tipped. Margins slightly serrate. Tetraploid MMPR.
Georgia range: Dade County

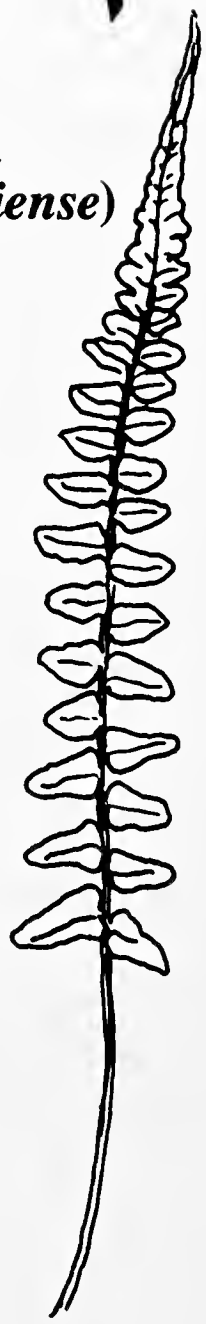
Scott's Spleenwort (*Asplenium x ebenoides*)

Fronds 4 to 8 inches long, 1/2 to 1 inch wide; evergreen, tufted. Stipe shining purplish brown; rachis lower brown, upper green. Blade long-oblong, with long tapering tip. Cut into a wide variety of patterns irregular in outline. Pinnate at base, pinnatifid toward apex. Pinnae and segments very asymmetrical. Margins of pinnae and segments shallowly toothed or wavy. Diploid PR.
Georgia range: Dade County



Kentucky Spleenwort (*Asplenium x kentuckiense*)

Fronds 2 to 5 inches long, 1/2 to 1 inch wide; tufted, erect, spreading. Stipe shining brown to black; rachis lower brown to black, upper green and flat. Blade lanceolate with long tapering blunt tip. Pinnate with pinnatifid apex. Basal pinnae deltoid progressing to oblong with pinnatifid lobes at apex. Lowest pair with superior auricles. Margins mostly entire. Triploid MPR.
Georgia range: Stephens and Bibb Counties



Wherry's Spleenwort (*Asplenium x wherryi*)

Fronds 1 to 5 inches long and 1/2 to 1 1/2 inches wide; tufted, evergreen. Stipe dark brown; rachis flat, green, grooved. Blade lanceolate. Base bipinnate, grading to bipinnatifid and pinnatifid at apex. Pinnae alternate, oblong-triangular. Pinnate at base and pinnatifid at apex. Basal pinnae largest. Margins serrate to cut in triangular segments. Triploid MMP.
Georgia range: Whitfield County

The Wood Fern (*Dryopteris*) Hybrids

The species of *Dryopteris*, or wood ferns, are most abundant in the northeastern United States, although several are common in Georgia. Among the temperate species in North America are 13 species (5 of which are of hybrid origin) and 27 sterile hybrids. James Montgomery described these in two excellent articles in *Fiddlehead Forum.* In Georgia there are two *Dryopteris* species of hybrid origin and two sterile hybrids. David Emory reported on one of the fertile ones in an earlier issue of *Tipularia*. The wood ferns generally grow in rich shaded woods or swamps.

Log Fern
(*Dryopteris celsa*)

This is a fertile hybrid whose parents were *D. ludoviciana* and *D. goldiana.*
Fronds 3 to 4 feet long and 8 to 12 inches wide; dark green, leathery, evergreen, slightly narrowed at base and gradually tapering to top. Pinnate-pinnatifid. Pinnae lanceolate, long tapering and deeply lobed. Stipe and rachis green and scaly. Tetraploid LLGG.
Georgia range: Dade, Walker, Murray, Columbia, Fulton and Macon Counties

Crested Wood Fern
(*Dryopteris cristata*)

This is a fertile hybrid whose parents were *D. ludoviciana* and *D. "semicristata,"* the latter a hypothetical species that is likely extinct. The fertile fronds are 10 to 20 inches long and 2 to 4 inches wide, erect and deciduous. The sterile are 5 to 15 inches long and 1 1/2 to 3 inches wide, spreading and evergreen. Stipes green above, dark below, with sparse brown scales. Blades narrowly oblong, pinnate-pinnatifid. Basal pinnae widely spaced, triangular. Apical closer and more oblong. All broadest near stipe, short, tapering to blunt tip. Segments with serrate margins. Pinnae of fertile fronds twisted at right angles to plane of blade (like an open Venetian blind). Tetraploid SSLL.
Georgia range: Fulton County

Susquehanna Hybrid Wood Fern
(*Dryopteris x neo-wherryi*)

A sterile hybrid of *D. goldiana* and *D. marginalis.*
Fronds 17 to 25 inches long and 5 to 9 inches wide; clustered, leathery, lustrous golden green. Stipe with large, tan scales; rachis tan, slightly scaly. Blade oblong-ovate with long, pointed tip. Bipinnate to pinnate-pinnatifid. Pinnae, lowest pair opposite, others alternate; deeply cut; oblong with long pointed tips. Pinnules oblong with pointed tips and variously incised margins. Fertile pinnae on upper part of blade. Diploid GM.
Georgia range: Union County

Southern Hybrid Wood Fern
(*Dryopteris x australis*)

A sterile hybrid of *D. celsa* and *D. ludoviciana.*
Fronds 20 to 22 inches long and 5 to 8 inches wide; dark green, leathery, evergreen. Stipe tan with brown scales; rachis tan, lower very scaly, upper less so. Blade widest in middle, narrowly elliptical with short, tapering tip. Pinnate-pinnatifid. Pinnae alternate, dimorphic. Upper fertile pinnae narrower and more widely spaced than lower sterile ones. Fertile pinnae approximately one-half of blade. Pinnules oblong with rounded tips. Triploid LLG.
Georgia range: Bartow County

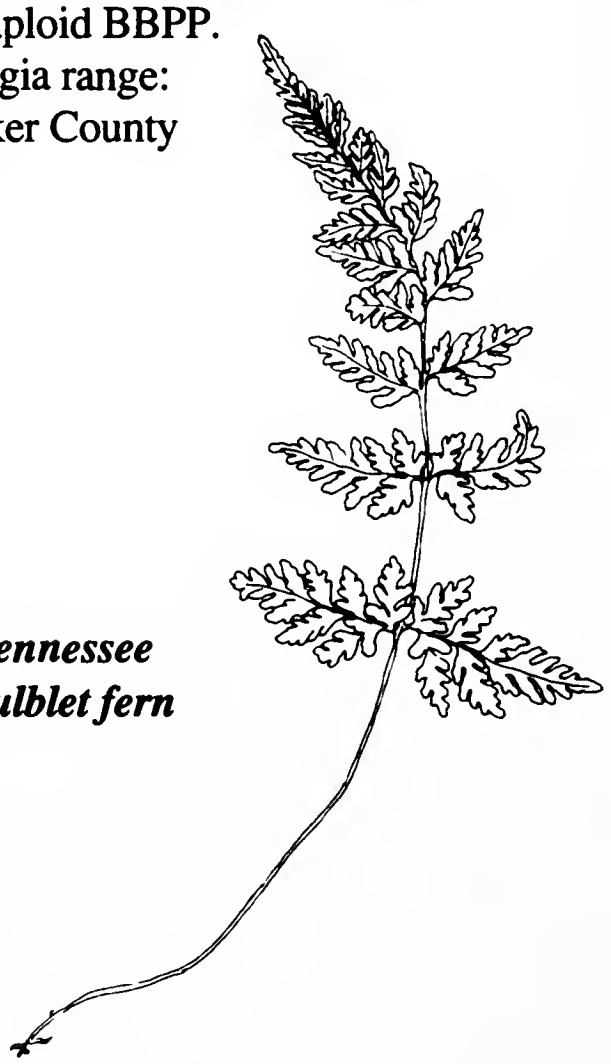
The *Cystopteris* Hybrid

Tennessee Bulblet Fern (*Cystopteris tennesseensis*)

This is a fertile hybrid of *C. protrusa* and *C. bulbifera*. It is epipetric on limestone and sandstone rocks and cliffs. Fronds 5 to 12 inches long and 1 to 4 inches wide; dark green above, lighter green below. Stipe black-brown below, green or straw-colored above. Rachis green to straw-colored, glabrous. Blade bipinnate, narrowly deltoid to lanceolate, broadest at base with acuminate tip. Basal pinnae ovate-deltoid or lanceolate with acute apex. Upper pinnae lanceolate with shorter stems, apex pinnatifid. Pinnules mostly lanceolate with short stems and toothed lobes.

Tetraploid BBPP.

Georgia range:
Walker County



Tennessee bulblet fern

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Illustration by Vicki Holifield

More about Picky *Pycnanthemums*

Can taxonomy be practical after all?

By Henrietta Chambers and John Hamer

L. Scott Ranger is correct! (See Those picky *Pycnanthemums,* Fall, 1990, *Tipularia*, Pp. 11-14.) *Pycnanthemum* (Lamiaceae) is a difficult genus. Botanists have struggled with its taxonomy since before Asa Gray (1842) was "induced to give a revision of the whole genus," because of difficulties encountered in distinguishing species. More recently, *Pycnanthemum* has been monographed by Elizabeth Boomhour (1941), Elizabeth Grant & Carl Epling (1943), Henrietta Chambers (1961b), Todd C. Yetter (1989) and Jon Hamer (Dissertation in progress). Yetter's work centered on the Virginianum Group and will not be included in this discussion. Hamer's work has resolved some of the taxonomic relationships in the Incanum Group; however, identification of species remains a problem, as always. The situation is made more difficult when the treatments in the regional floras differ in their interpretations of the taxa. We hope that this article will help interested persons understand more about this genus in Georgia, and will also carry the strong message that taxonomy can be changed as a result of research. When state and regional floras incorporate the conclusions of research into their handling of controversial genera, we can all benefit.

Mountain mint is the common name

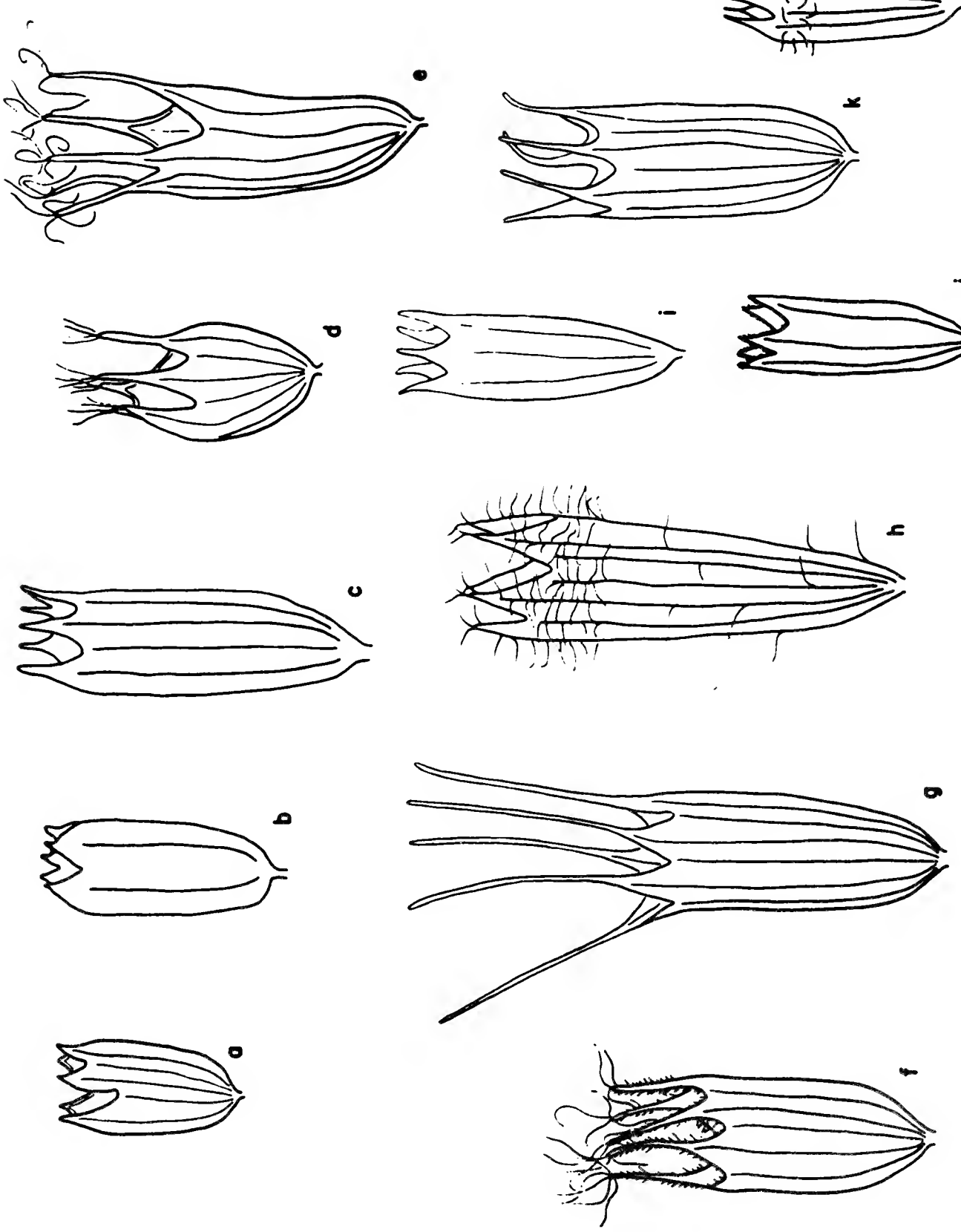

Figure 1. Calyces of *Pycnanthemum* species that occur in Georgia. a-e. Incanum Group: a. *albescens*, b. *curvipes*, c. *floridanum*, d. *loomisii*, e. *pycnanthemoides*, f-l species from other groups: f. *beadlei*, g. *flexuosum*, h. *montanum*, i. *muticum*, j. *nudum*, k. *setosum*, l. *tenuifolium*. X 11.

for *Pycnanthemum*. We were unaware of the name Tennessee mountain mint for *P. curvipes*. Although this taxon grows in Tennessee, the original plant material designated as *P. curvipes* was from Stone Mountain (DeKalb County), Georgia (=type locality). *P. curvipes* belongs to the Incanum Group or complex of species in which there are seven taxa: *P. albescens*, *P. clinopodioides*, *P. curvipes*, *P. floridanum*, *P. incanum*, *P. loomisii* and *P. pycnanthemoides*. The group is characterized by relatively broad leaves, small flowers in loose clusters, and a bilabiate calyx. In a bilabiate calyx there is an upper lip with three teeth and a lower lip with two more deeply cleft teeth. In *P. curvipes* the teeth are less than 1.5 mm. long with very little difference in the depth of the clefts separating the five teeth. Therefore, the bilabiate nature of the calyx is not obvious.

Five of the species in the Incanum Group occur in Georgia. The most widespread are *P. loomisii* and *P. pycnanthemoides*, which are sympatric and in Georgia extend from the Appalachian highlands to the surrounding Piedmont. *P. curvipes* occurs disjunctly in Chattooga, Cobb, DeKalb and Floyd Counties together with *P. loomisii* and *P. pycnanthemoides*. *P. albescens* and *P. floridanum* extend northward from Florida into Georgia's southernmost counties. *P. incanum* and *P. clinopodioides* reach their southern limits in North Carolina and hence do not occur in Georgia. Unfortunately, the treatment of *Pycnanthemum* in the regional flora by Radford *et al.* (1968) lumps several species under the name *P. incanum* and omits some members of the Incanum Group found in Georgia (see also Ranger, 1990). In the work by Wofford (1989), on the other hand, several of the taxa are merged in P. *pycnanthemoides*.

In addition to the five species of the Incanum Group growing in Georgia, seven other *Pycnanthemum* species are present: *P. beadlei*, *P. flexuosum*, *P. montanum*, *P. muticum*, *P. nudum*, *P. setosum* and *P. tenuifolium*. These species differ from those in the Incanum Group in that they lack one or more of the distinguishing morphological features mentioned above. These taxa are separated largely by differences in leaf size and shape, bract morphology, pubescence, and distinctive characteristics of the inflorescence and calyx. The differences in calyx size and form of the twelve Georgia species are shown in Figure 1.

Henrietta Chambers has studied mountain mints since 1958, with major emphasis on their ecology, cytology, breeding behavior and meiotic behavior of natural and artificial hybrids. These studies have been utilized to try to discover the relationships between the species within the genus and to build upon the knowledge of earlier workers like Grant and Epling (1943) and Boomhour (1941). Morphological traits were the major consideration for the placement of species into groups. The chromosome data aided in the arrangement of species within groups. Once the ploidy level(s) was known, the diploid parents of polyploid species could sometimes be assigned. The 19 *Pycnanthemum* species include diploid through hexaploid chromosome numbers (Table 1). Those species which grow in Georgia are marked with an asterisk. With the exception of *P. californicum*, endemic to California

and Nevada, all of the species grow in the eastern United States. Chambers (1961b) recognized the same species as Grant and Epling did (1943), with several exceptions. She included *P. curvipes* in *P. incanum* and placed *P. puberulum* and *P. viridifolium* in *P. pycnanthemoides* (which is the correct name for the taxon Grant and Epling called *P. tullia)*. Chambers and Chambers (1971) recognized *P. curvipes* as a species, after comparing living material with other species and determining that its chromosome number is unique within the Incanum Group (n=20). The only new chromosome count reported here is for *P. floridanum* (n=39) from Alachua County, Florida (Table 1.).

More recent studies on *Pycnanthemum* include those by R. Keith Carr and Gordon Hunter (1973) on flavonoids. Theirs was a preliminary study using paper chromatography, in which spot patterns of fifty-seven collections of twelve species and several hybrids were compared. Identical flavonoid compounds were found in *P. loomisii* and *P. pycnanthemoides*, species which are difficult to separate on morphological characters but which cytological studies have shown to be diploid and tetraploid respectively. Thus *P. pycnanthemoides* seems certainly to be of autopolyploid origin.

GROUP	DIPLOID	TETRAPLOID	PENTAPLOID	HEXAPLOID
Incanum	*albescens** (19)	*albescens* (38)		
	*loomisii** (19)			
	*curvipes** (20)			
		*pycnanthemoides**(36)		
		incanum (38)		
		clinopodioides (38)		
		*floridanum** (39)**		
Californicum	*californicum* (20)			
Flexuosum	*flexuosum** (18)	*setosum** (38)		
Montanum	*montanum** (20)	*beadlei** (38)		
Nudum	*nudum** (20)			
Virginianum	*muticum** (20)	*muticum** (40)	*muticum** (ca.54)	
	*tenuifolium** (20)	*tenuifolium** (40)		
		verticillatum (38-39)		
		pilosum (39)		
		virginianum (40)		
		torrei (40)		*torrei* (ca. 60)†

** This is the first publication of the chromosome count for *P. floridanum*. This material was collected in Alachua County, Florida: Gainesville, SW 34th St. at Museum Road (Hwy 12 between Hwy 26 and 24) on west side of highway in roadside border of woods. H. L. Chambers 1676, July 3, 1978.

†This is the first publication of a hexaploid count for *P. torrei*. This material was collected in Putnam County, Tennessee, west end of Cookeville, low roadsides along Hwy 70. R. Keith Carr 170, August 20, 1969.

Table 1: Haploid chromosome numbers and ploidy levels of *Pycnanthemum* species. Taxa which occur in Georgia are indicated with *. (We don't know ploidy level of *P. muticum* and *P. tenuifolium* in Georgia.) (Chambers and Chambers (1971) with additions.)

GRANT & EPLING	BOOMHOUR	CHAMBERS	HAMER
P. albescens	*P. albescens*	*P. albescens*	*P. albescens*
P. curvipes	*P. curvipes*	*P. curvipes*	*P. curvipes*
P. incanum	*P. incanum* ssp. *incanum*	*P. incanum*	*P. incanum*
P. loomisii	*P. incanum* ssp. *loomisii*	*P. loomisii* ssp. *loomisii*	*P. incanum*
P. tullia	*P. pycnanthemoides*	*P. pycnanthemoides*	*P. incanum* ssp. *pycnanthemoides*
P. puberulum	*P. pycnanthemoides*	*P. pycnanthemoides*	*P. incanum* ssp. *pycnanthemoides*
P. viridifolium	*P. pycnanthemoides* var. *viridifolium*	*P. pycnanthemoides*	*P. incanum* ssp. *pycnanthemoides*
P. floridanum	not included	*P. floridanum*	*P. floridanum*
*P. clinopodioides**	*P. clinopodioides*	*P. clinopodioides*	*P. clinopodioides*

* Recognized but not placed in Incanum Group
Grant & Epling, 1943. Boomhour, 1941. Chambers, 1961a & Chambers and Chambers, 1971. Hamer (Dissertation in progress)

Table 2: Past and Current Circumscriptions of Incanum Group taxa.

Brian Lawrence, John K. Morton and Chambers (1974) correlated the chromosomal work of Chambers (1961a) with the essential oils of *Pycnanthemum* and found inter- and intraspecific difference in the oil components. Oil analysis showed that *P. beadlei*, a tetraploid of hybrid origin, contained the compounds found in *P. montanum* and *P. muticum*, the two diploid species that are its probable parents.

Recently, Jon Hamer used numerical taxonomic methods to address systematic problems in the Incanum Group. Principal components analyses of the species that contain diploids (*P. albescens*, *P. curvipes* and *P. loomisii*) showed good taxonomic separation, but when polyploid forms were included in the analyses, taxonomic separation was impossible. Principal components analyses also provided information on the probable origins of the polyploid forms. The polyploid species *P. incanum* clusters between *P. loomisii* and *P. curvipes*, suggesting an allopolyploid origin from these two diploid taxa. The polyploid *P. pycnanthemoides* clusters adjacent to *P. loomisii*, which suggests that it is an autopolyploid derivative of *P. loomisii*, further supporting the data of Carr and Hunter (1973). Because *P. loomisii*, *P. pycnanthemoides* and *P. incanum* can not be separated consistently by their morphology, Hamer has suggested that *P. loomisii* and *P. pycnanthemoides* be treated as subspecies of *P. incanum*. The circumscription of the Incanum Group according to Hamer (unpublished) is contrasted with other recent treatments in Table 2.

What about the status of *P. curvipes*? Present evidence indicates that it is a distinct species. Morphologically, it is most similar to *P. albescens* and *P. incanum* and can easily be confused with them. Ranger observed herbarium specimens from Cobb County annotated

with all three of these specific epithets. *P. albescens* and *P. incanum* resemble *P. curvipes* in many vegetative and inflorescence features but have more distinctly bilabiate calyces. As far as we know, neither of these two species occurs within the range of *P. curvipes*.

Is *P. curvipes* threatened or endangered? Ranger notes that the plant thrives on the poor, rocky soils of Kennesaw Mountain Battlefield National Park. Because it is a diploid and possibly a relict species, having a sporadic distribution in Georgia, Tennnessee, Alabama and North Carolina, it merits continued study for possible protection under state and federal endangered species laws.

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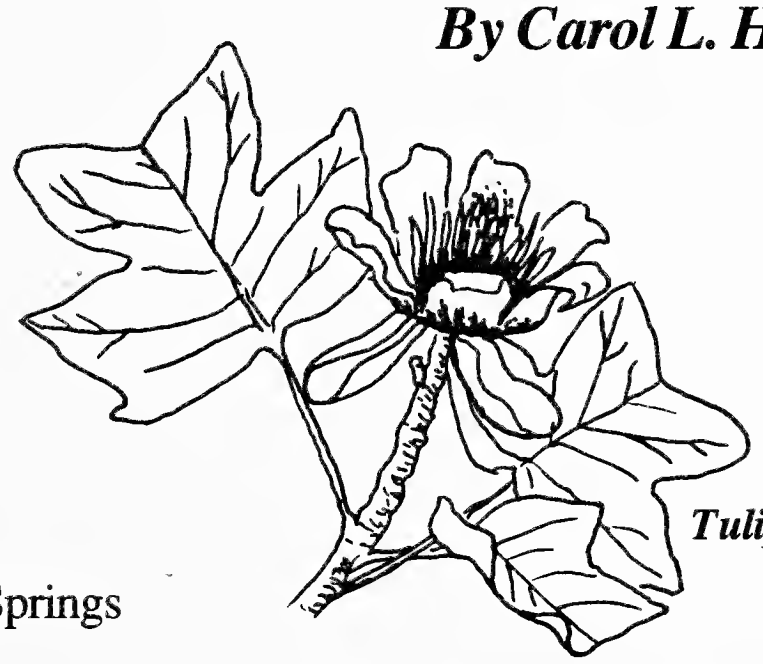
Land Use History and Floristics of Indian Springs and High Falls State Parks

By Carol L. Howel



Tulip poplar

A floristic survey of Indian Springs and High Falls State Parks was conducted during the growing seasons of 1988 and 1989. These central Georgia parks are approximately 60 miles south of Atlanta, a few miles north of the Fall Line. Indian Springs and High Falls State Parks were chosen for study after a search of literature and herbarium records indicated a significant lack of information about the flora of the lower central Piedmont of Georgia.

Indian Springs State Park is located in Butts County, south of Jackson, and approximately eight miles east northeast of High Falls State Park. It comprises 418 upland acres plus the 105-acre Lake McIntosh. Lake McIntosh is fed primarily by Hopoetnyeloholo Creek (named for a Creek Indian; also known as Sandy Creek).

High Falls State Park is located in the northwest corner of Monroe County, approximately 15 miles north of Forsyth. High Falls consists of 345 upland acres and the 650-acre High Falls Lake. High Falls Lake is fed primarily by the Towaliga River and Buck and Brushy Creeks.

Land Use History, 9,000 B.C. to 1821 A.D

It is widely accepted that man's activities have a large impact on vegetation. To better understand current vegetative conditions at Indian Springs and High Falls, a brief summary of man's previous uses of the land in these areas was compiled. The early land use history of Indian Springs and High Falls State Parks is similar to that of the rest of central Georgia, dating back to the arrival of the first nomadic hunters in approximately

9,000 B.C. (Monroe County Historical Society, 1979). Archaeological evidence suggests that these peoples foraged and hunted off the land (Pope, 1961).

The establishment of the first Indian settlements in lower central Georgia occurred during the Archaic period, from 7,000 to 2,000 B.C. By this time, reliance on hunting large animals diminished and a tradition of gathering woodland vegetables, fishing, hunting and trapping small animals developed (Hudson, 1976). According to Swanton (1979) and the Monroe County Historical Society (1979), some of the plant foods these Indians foraged for include: chestnuts, hickory nuts, walnuts, acorns, grass seeds, crab apples, wild grapes, plums, wild peas, persimmons, prickly pears, raspberries, strawberries, wild sweet potatoes, cherries, sassafras, wild greens (poke), dandelions, onions, roots of greenbrier, wild morning glory and Jerusalem artichoke. Tobacco mixed with leaves of sumac and sweetgum was commonly smoked, and a green alga found on rocks in creek beds was dried and used for salt.

It is interesting to note that many of the plants used in the Archaic and Woodland Periods are still found in the area.

The Indians of the Woodland Period (2,000 B.C. to 700 A.D.) had gardens of squash, sunflowers, bottle gourds, beans, pumpkins and sweet potatoes (Monroe County Historical Society, 1979). However, woodland products still provided a large portion of the Indian food supply. Many other woodland products were used for non-food items (Swanton, 1979). Dogwood, honeysuckle, oak, river cane and cattails were made into baskets and mats; poplar, hickory, oak, sassafras and willow were used in building houses; poplar was used for canoes; red oak, maple, sassafras and cedar were used to make weapons such as bows, arrows and blow guns. Thistle down was used for feathering blowgun darts. It is interesting to note that many of the plants used in the Archaic and Woodland Periods are still found in the area.

Around 900 A.D., following a population explosion of Mississippi Valley Indians, the Woodland Indians near Macon, Georgia, were displaced by intruders of the expanding Mississippi tribe (Hudson, 1976). Thus began the Mississippian Period which lasted from 900 A.D. to 1540 A.D. These new settlers were mound builders whose earthworks still stand on the Macon Plateau. Often referred to as the "Master Farmers," these Indians lived a life style that was governed by their agriculture (Monroe County Historical Society, 1979). Common crops included squash, pumpkins and tobacco. Bean and especially corn remnants have been widely found in the southern U.S. Though agriculture was of major importance, wild plants such as acorns, persimmons, cane, hickory and walnut were still in use (Sheldon, 1982).

The Historic Period, from 1540-1821, saw the beginning of European expansion in Georgia. Several explorers and settlers wrote brief descriptions of the lower central

Georgia area. Hernando DeSoto and his expedition, crossing middle Georgia in the early 1540's, encountered dense forests which were difficult to get through (Hudson, 1976). William Bartram passed through middle Georgia in the 1770's, within thirty miles of the area that is now known as High Falls State Park. Here, Bartram reported seeing savannahs and grand forests with oaks, hydrangeas and many showy flowers (Van Doren, 1928).

In 1775, James Adair, who traded with the Indians for forty years, observed that corn was the chief produce of the southern Indians, and that they ate "parched corn-flower." He also mentioned that the Indians had cleared plantations and used hickory and oak saplings for fences around gardens. Adair stated that "every dwelling has a small field of beans, peas and corn," and continued, saying that the Indians used "many herbs and roots of which the general part of the English have not the least knowledge" (Adair, 1775). In 1797, Col. Benjamin Hawkins, congressman and agent for Indian affairs, described middle Georgia as having steep wooded hillsides. Poplar, oak, hickory and dogwood grew in some places; other areas were pure pine stands (Hawkins, 1916).

Land Use History, 1821 to Present: Indian Springs

Prior to the arrival of European settlers, the vicinity of Indian Springs had received little impact. The local Indians considered the spring water sacred and of great medicinal value, and therefore protected the immediate spring area (Anonymous, 1906).

Presumably, the first European to discover Indian Springs was Gabriel Dunlap in the spring of 1792 (Anonymous, 1906). Legend has it that Dunlap was searching along the Towaliga River, when he heard the war cry of the Creeks. Cut off from retreat, he headed north and eventually came upon "an immense cane brake" in which he hid (Anonymous, 1906). On leaving the cane brake, he noticed a sulfur-like smell and found the spring. This legend is the only reference to the existence of a cane brake at Indian Springs. No canebrake or evidence of a former canebrake has been located.

The local Indians considered the spring water sacred and of great medicinal value and therefore protected the immediate spring area.

After the new settlers arrived, land disputes created considerable friction between the Europeans and the Indians. By 1821, hostilities between the Indians and Europeans had reached a peak which culminated in the famous treaty of Indian Springs. Much to the dismay of the majority of the Creeks, Indian Chief McIntosh signed a treaty that ceded all but a few of the remaining acres of Indian land in Georgia to the Americans (Griffith, 1988). McIntosh, who had led only a minority group, was stoned to death in 1825 by the other Indians for his involvement in this fraudulent treaty (Swanton, 1979; Anonymous, 1906). In 1825, a valid treaty was signed which ultimately removed the Indians (Harmon, 1941). By 1828, the Indian

Springs area had become a popular resort for the new settlers, who, like the Indians, believed that the spring waters had curative powers (Norwood, 1978; Banks, 1872).

Upon cession in 1821, Butts County (then included in Monroe and Henry Counties) was surveyed for a land lottery, but exempted the 1,640 acres around the spring which was designated the Indian Springs Reserve. In 1827, the Indian Springs Reserve was divided into 73 lots (from 2-39 acres) which were sold to create the town of Indian Springs. However, the 10 acre plot, Indian Springs Lot No. 1, immediately surrounding the spring was set aside, reserved for public use only, and the land title was retained by the State of Georgia (Anonymous, 1821). For this reason, many people consider Indian Springs to be the oldest park in the nation.

Vegetation in Indian Springs Lot No. 1 remained relatively intact, undeveloped and unfarmed.

The land and the vegetation surrounding Indian Springs Lot No. 1 was heavily used when hundreds of people came to partake of the curative powers of the spring waters (Banks, 1872). As a result of this influx of people, nine hotels were built to accommodate the visitors. Among the most notable were the Elder House (1851), Rock Castle (1873), the Foy House (c. 1880) and the Wigwam (1890) (McMichael, 1978). All but one of these hotels were either torn down or burned, and no longer exist. In 1823, Creek Chief McIntosh built the Indian Springs Hotel (now known as the Varner House), the only original hotel which still stands today. In the late 1800's, the Hoard and Mullis Amusement Park existed west of the spring, on the other side of the Hopoetnyeloholo River. Except the area immediately around the spring where visitors lounged and to the east near the hotels, the vegetation in Indian Springs Lot No. 1 remained relatively intact, undeveloped and unfarmed.

In 1927, Indian Springs State Park was established to include Indian Springs Lot No. 1 and approximately 500 additional acres. In the early 1930's, the Civil Conservation Corps (CCC) work force of about 150 men built several rock buildings, including the museum and several rustic bridges at Indian Springs State Park. CCC member Bill Webb (pers. comm.) worked at Indian Springs from September 1933 to March 1934. He states that pines 12-13 inches in diameter were cut from the area to build the bridges, while most other materials were brought in from elsewhere. Trees and shrubbery were planted around the new buildings, but exact species are not known.

In 1957, a lake was completed at Indian Springs State Park in order to provide water recreation for the park. Impounded by an earthen dam, Lake McIntosh flooded 105 acres of presumably forested land to the northwest of Land Lot No. 1. Only a small tract of what is likely original vegetation remains today along the park nature trail.

Land Use History, 1821 to Present: High Falls

In 1821, the area including High Falls was organized into counties. Monroe County, named for the fifth president of the United States, was formed and divided into lots as part of the land lottery in 1821. In the vicinity of High Falls State Park, land was cleared for the town of Unionville (later called High Shoals, and finally called High Falls). The city of High Falls (from 1879-1899) had a maximum population of 200 people, and was named for the nearby 100 foot high waterfall of the Towaliga River. One of the first roads through central Georgia crossed the Towaliga River at High Falls. The refurbished bridge still stands but is used only for foot travel.

The town of High Falls was primarily a farming community. By the 1900's, most of the High Falls area was or had been under cultivation. A resident of High Falls for 88 years, William Westbrook (pers. comm.) stated that in the early 1900's from his grandfather's porch he could look north out over a mile of cotton fields and see High Falls dam. However, the arrival of the boll weevil in the 1920's diminished cotton farms all across Georgia. The Monroe County Historical Society (1979) reports that cotton production in Monroe County went from 57,455 bales produced in 1919 to 40 bales produced in 1969. Farmers then shifted to planting large acreage in wheat and corn (Wynn, 1921). Old terraces, barbed wire fences and rock piles found throughout High Falls State Park today indicate past farm usage.

In 1904, construction was completed on an approximately 35 foot high granite rock dam on the Towaliga River. Located a few hundred yards above the waterfalls, the dam created the 650 acre High Falls Lake and was used to generate electricity for cotton mills in Griffin, Georgia. The power plant was operated until 1953, at which time it was turned over to the Hiawasee Timber Company. In 1961, this company donated the lake and surrounding land to the Georgia State Game and Fish Division. In 1966, High Falls State Park was formed.

Currently, most of the previously cultivated land at High Falls has reverted to pine forests of various ages. Based on the land use history and current vegetative conditions, it is doubtful that any original vegetation remains at High Falls State Park.

Old terraces, barbed wire fences and rock piles found throughout High Falls State Park today indicate past farm usage.

Original Vegetation

During the course of the floristic survey, it was discovered that land in the vicinity of the Indian Springs Overland Nature Trail (the northwest portion of the former Indian Springs Lot No. 1) apparently supports original vegetation. As discussed, land use history indicates that this tract has been protected by both Indians and European settlers, who allowed only minimal disturbances. Additionally, current conditions in the nature trail area do not

indicate any past disturbances. There are no old terraces, barbed wire fences or rock piles as evidence of previous farming. The presence of large-sized, valuable timber species and the lack of old stumps makes the possibility of former cutting or thinning seem unlikely.

The timber species include primarily white oak (*Quercus alba*) and tulip poplar (*Liriodendron tulipifera*). Several specimens of white oak are between 40 and 44 inches (101 and 111 cm) in diameter at breast height (DBH). There are at least ten tulip poplar trees (a few of which are visibly hollow) that measure from 58 to 64 inches (147 to 162 cm) DBH. One black oak (*Quercus velutina*) and one loblolly pine (*Pinus taeda*) measure approximately 37 inches (95 cm) DBH. Trees of these sizes are extremely unusual for the Piedmont, and are probably well over 200 years old. It should be noted, however, that there have been no reliable studies done on the correlation between diameter and age of hardwood trees in the Piedmont (Klaus Steinback, pers. comm.).

In December 1991, on a Georgia Botanical Society field trip to the Indian Springs Overland Nature Trial, it was noted that a white oak had fallen and been cut to clear the path. The diameter of this tree at nine feet above ground measures 30 inches (76 cm). A count of the tightly compacted rings suggest that particular specimen lived 250 years.

1821 Forests at Indian Springs

Some of the first data available on Georgia forests were generated by early land surveyors during the land lotteries of early European settlement. Surveyors marked off land into a grid of squares, mapped common names of "witness trees" to mark the corners, and recorded locations and common names of two trees to indicate each side of the square. Each square represented one land lot to be sold in the land lottery. The Indian Springs vicinity was surveyed for the 1821 land lottery, but the Indian Springs Reserve was not included at this time.

In an effort to recreate the 1821 forests in the Indian Springs area, the witness tree species indicated on the original maps were tabulated for an area covering 99,424 acres around Indian Springs. All of the 29 species listed on the 1821 land lottery map

The floristic survey of Indian Springs and High Falls State Parks documented a total of 556 species.

were found at Indian Springs during the course of this study, with the exception of blackjack oak. The reconstruction of the 1821 forests in the Indian Springs vicinity showed an oak-hickory-pine composition in a ratio of 56:11:8.

In a similar study, Plummer (1975) concluded that Georgia's forests today probably have compositions similar to what they had 200 years ago, except the trees are much smaller and there are more pines in the Piedmont. Plummer also stated that while general impressions can be derived from these land lottery maps, they have not been useful in quantitatively determining species densities.

Vegetative community data were collected along the Indian Springs

nature trail during the 1988 growing season. Due to differences in sampling technique, sample size and sample location, it is difficult to make qualitative comparisons with the 1821 survey, although a few generalizations can be made. In the 1988 survey, tulip poplar and beech seem to be more prevalent than indicated in the 1821 survey. Pine was more prevalent in the 1821 survey.

Current Floristics

The floristic survey of Indian Springs and High Falls State Parks documented a total of 113 families, 337 genera, and 556 species (424 species from Indian Springs and 432 species from High Falls). The collections were deposited in the University of Georgia Herbarium, Athens. Based on Jones and Coile (1988), species not previously recorded from Monroe County totaled 404 and those from Butts County totaled 405 (a combined total of 512 different taxa). For a complete list of species, refer to Howel (1991).

No state records were discovered, and no state or federal threatened or endangered species were located on either park. This is primarily due to past disturbances and lack of appropriate habitat. Many of the protected and special concern species known from the lower central Piedmont of Georgia are associated with granite rock outcrops, which do not naturally occur at High Falls or Indian Springs.

The species differences between Indian Springs and High Falls State Parks were few. Species found at Indian Springs but not found at High Falls include: turtlehead (*Chelone glabra*), grass-leaved ladies' tresses (*Spiranthes praecox*) and fly-poison (*Amianthium muscaetoxicum*). Several species were found only along the Indian Springs Overland Nature Trail: abundant trout lily (*Erythronium americanum*), abundant May apple (*Podophyllum peltatum*), starry campion (*Silene stellata*) and little sweet Betsy (*Trillium cuneatum*). Species found only at High Falls include: pepper-vine (*Ampelopsis arborea*), mistletoe (*Phoradendron flavescens*), hop hornbeam (*Ostrya virginiana*), Jimson weed (*Datura stramonium*), spider-lily (*Hymenocallis occidentalis*), rattlesnake-master (*Manfreda virginica*) and sleepy catchfly (*Silene antirrhina*).

Range extensions were found for several species. Four species which are primarily mountainous and only occasional in the Piedmont were documented: toothwort (*Cardamine diphylla*), Deptford pink (*Dianthus armeria*), dovesfoot geranium (*Geranium molle*) and panic grass (*Panicum clandestinum*). Four coastal plain species were found: Titi (*Cyrilla racemiflora*), laurel oak (*Quercus hemisphaerica*), goldenrod (*Solidago laevenworthii*) and eelgrass (*Vallisneria americana*). Three Coastal Plain species which occasionally extend farther north were found: plume grass (*Erianthus giganteus*), grass-leaved ladies' tresses (*Spiranthes praecox*) and wax myrtle (*Myrica cerifera*).

In conclusion, both Indian Springs and High Falls State Parks support typical secondary Piedmont vegetation. Only a small area of original vegetation remains and is located along the Indian Springs Nature Trail. Anyone in the Indian Springs area during early spring should make a point of walking the nature trail to see not only the large trees, but also the trout lily and May

apple which carpet much of the upper slopes. Spring visitors to the High Falls Nature Trail will be treated to both a 100-foot waterfall and a good spot to study Fall Line geology.

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Field Botanist for The Ages: Angus Gholson

By Tim Stevens

The khaki-clad gentleman squatted down on his knees. He perused a moist area of naked Ocala Limestone protruding amidst black sedge, hairgrass, lopsided Indian grass and bushy beardgrass, looking for whatever he could find on this northwest Florida glade site. In the moist area, just below a saturated slope, his eyes stumbled across a dwarfish, Lilliputian plant, not much larger than one of the tiny, aquatic duckweeds.

"At first we had no idea what the plant was," Angus Gholson explained. "All we knew, it was small and it was flowering." Gholson collected a sample of the diminutive, arcane plant and carried it to Dr. Robert Godfrey of Florida State University for identification. "Dr. Bob," as Gholson affectionately calls his close friend Godfrey, first suggested, then later confirmed that the tiny plant discovered by Gholson was in fact *Lepuropetalon spathulatum*, a miniature member of the saxifrage family — this glade site being its only known Florida location.

Angus Gholson stands six feet tall and is of average build. His head full of gray hair and evident fervor for life make him seem considerably younger than his seventy or so years.

Gholson lives with his wife Eloise in a handsome, two-story, white house in Chattahoochee, Florida, with a giant, venerable live oak behind it, positioned over a parking area where sits "Old Whitey," Gholson's 1970 white Chevrolet Impala. Old Whitey sits parked, marking time beneath the mammoth live oak — immaculate, but giving off a slightly mildewy odor once you get in and shut the doors.

Gholson's khaki pants and shirt, his tan cap bearing a Nature Conservancy patch and his deep, deliberate, sonorous southern voice could tend to conceal his professional and educational achievements. Gholson was a 1948 honors graduate in forestry from the University of Florida, and he worked

for thirty years with the U.S. Army Corps of Engineers as a resource manager at the Jim Woodruff Dam and Lake Seminole project at Chattahoochee.

As a resource manager, Gholson was confronted with a substantial problem soon after the impoundment of Lake Seminole in the form of an infestation of water hyacinth (*Eichhornia crassipes*). It was in dealing with this infestation that Gholson came to a new appreciation for botanical diversity. "This experience opened my eyes. I began to look around," he said. "The diversity of plants began to have meaning."

Gholson began to read and study every pertinent botanical work he could acquire, and he began a small, working herbarium. "I was amazed at the number of aquatic plants in Lake Seminole," he exclaimed. "Plants and their importance to all life on this planet began to have real meaning." The herbarium grew and expanded until, in 1974, the Corps let Gholson move it permanently to his home. It now contains nearly 15,000 meticulously mounted specimens, and Gholson has amassed a prodigious botanical library, an extensive correspondence file and a guest log with hundreds, if not thousands of entries.

"Botany will become more and more important as we continue to destroy this place where we live."

Never one simply to amass information for its own sake, Gholson has always been ready to share his accumulated knowledge with others exhibiting similar interest. An excellent example of this took place recently when a Harvard student wrote Gholson about his desire to come to "Gholson territory" in order to research the southeastern milkweeds.

"As I recall," recounted Dr. Godfrey, "Angus must have spent the better part of a couple of weeks finding local populations of various (milkweed) species, carefully recording exactly where each was, and even flagging individual plants." All this preparatory work, according to Godfrey, saved the student untold numbers of potentially fruitless hours in the field and is quite typical of Angus Gholson's willingness to assist aspiring botanists.

Gholson aided Godfrey considerably as well while Godfrey was writing his incomparable University of Georgia Press books on southeastern trees, shrubs, vines and wetland plants. "Angus read many of the parts of each book during the writing of them, made innumerable helpful comments and tested the keys," said FSU's Godfrey. Gholson also helped collect the enormous number of plant specimens necessary for use as models for the illustrations used in Godfrey's books. "Moreover and most importantly," added Godfrey, "he was in his own inimitable way a constant morale booster. I owe him!"

Gholson's commitment to increase morale and stimulate botanical interest emanated in large part from Dr. Robert Thorne, a botanist who took part in an early pre-impoundment study of the Lake Seminole area. Gholson was

assigned to help Thorne in the field, and the two collected extensively, often not returning until late at night and then staying up until one or two in the morning to press their specimens. "It was just fascinating to talk about these plants and all that sort of thing," said Gholson. "I was extremely impressed with the knowledge, interest and enthusiasm of Dr. Thorne."

It was Thorne's enthusiasm that proved especially contagious to Gholson, and this same acquired enthusiasm has helped to make Gholson one of the best known field botanists in the southeastern United States. Gholson-led field trips are legendary for their wonderful blending of jocularity, instruction and reverential veneration for the landscapes where they take place.

Perhaps the most significant influences on Gholson were his parents and the magnificent, sublime bluffs and ravines of the Apalachicola River region that he grew up in. "Being reared along the bluffs of the Apalachicola River exposed me to an area of immense beauty and diversity," Gholson explained. "This was constantly emphasized by my mother and father. My mother and father were keen lovers of nature and they never failed to encourage such a love in their children."

Since his 1983 retirement from the Corps of Engineers, Gholson has been indefatigable, conducting botanical surveys for the Corps, the Florida Natural Areas Inventory, the Florida Chapter of The Nature Conservancy and the Tall Timbers Research Station in Tallahassee, including an entire year (1986) surveying Ichauway Plantation in Baker County, Georgia. In 1991 he was awarded a Beadle Fellowship by

Tall Timbers, and The Nature Conservancy honored him as a "Conservation Colleague."

It is Gholson's unpretentious leadership that may be his greatest contribution. This leadership rests steadfastly upon his devotion to conservation, his deep love for plants and their habitats and his own indomitable perspective of life and its interconnectedness. "Nobody really knows how interrelated all of these things really are, mycorrhizal fungi, bacteria, and all that," he said. "You clear-cut a place, site-prepare it and turn all that dirt up, and you don't know what you're doing. We may be killing a lot of things in there that make the difference between things growing or not. Botany will become more and more important as we continue to destroy this place where we live."

First Person Singular: Plight of the Bumblee

By Bill Close

The camera is on a tripod directed at a lovely group of three pink lady's slippers (*Cypripedium acaule*). I look through the view finder and begin to focus when a pollination event similar to what I recently read about happens, exactly as I pictured it. A huge bumblebee comes to rest on top of one of the blossoms. It very deftly locates a slot near the top of the flower and slips inside.

I think, "What a break! I'm going to photograph her as she comes out." I wait and watch. The flower's walls undulate as it bounces around inside taking a pollen shower. (Some say the bee is confused and mad.) In about ten seconds a black leg emerges through the shower curtain. I decide to wait just a bit longer for more body to appear. As I watch, "pop," it comes out like a champagne cork and is gone.

Also gone is the opportunity to make what might have been a very outstanding photograph, but the image is forever recorded in my mind. I remember it clearly, which leads me to a thought I have often mulled over. My musings go like this: I had read about the bee bath and had a clear, though imagined, image of exactly how it would be. When it actually happened, I had a virtual image of the action, which then immediately shifted into memory.

And there you have it: one mind, one image with three interpretations. Imagination, experience, memory. So which is truth? Or does it require an equation? Something like **T = e(i+m)** where **T** (truth) equals **e** (experience) times **i** (imagination) plus **m** (memory).

Illustrated by Bill Close

Site-seeing: Black's Bluff

By Richard Ware & Andrew Kemp

The Black's Bluff area overlooking the Coosa River two miles below Rome, Georgia, has an outstanding hardwood forest with over 300 documented plant species. The Bluff has been well known to area residents for more than 100 years. In 1888, the local newspaper described Black's Bluff road as "one of the routes favored by Romans affluent enough to own or rent a carriage" due to the "grand scenery where the road is cut into the side of the mountain, and cliffs fall perpendicular to the Coosa River 20 feet below [the road]." In places the bluffs rise 200-300 feet from the river.

On December 11, 1920, the paper reported three local ministers took all 82 Cherokee Council Boy Scouts on a hike to Black's Bluff from Broad Street in downtown Rome. This was the first time all area scouts had been on a hike together. It was termed "a very eventful first hike, with a mountain-scaling contest and an impromptu cave exploration by young Cyril Hull, who descended into a brush-covered cave shaft to the full extent of a rope" estimated to be 75 feet long. On May 18, 1921, a group of boy and girl scouts went down the Coosa River on Captain Frank Holbrooks' steamer, the *Annie H.*, for a picnic at the beautiful mountainside spring at Black's Bluff.

Botanists have also long been coming to the Black's Bluff area. Alvan Wentworth Chapman had specimens from Rome dated 1872, 1882, and 1891. Henry William Ravenel visited the area in July, 1872. Boynton and Beadle, two of the Biltmore Botantists, collected hawthorns and other shrubs from the area in 1899. Roland Harper came to Rome in 1904, and is said to have walked to the Black's Bluff area from the railroad station. In 1954, Wilbur Duncan said the Bluff has "more rare and endemic plants per acre [than he] had ever seen." In 1990, all this recognition by botanists and local citizens alike culminated in the acquisition of 107 acres of Black's Bluff by The Nature Conservancy.

Black's Bluff boasts a massive rock formation over 500 million years old. In the quarry beside the preserve, the gray strata of the Conasauga formation are plainly visible. Overlying the limestone and shale of the Conasauga formation is a red mudstone reputed to be even older than the rocks below, the

result of an overthrust fault. Although the Conasauga is fossiliferous, the rock at this particular site is intensely shattered and most of the older fossils have been deformed or destroyed. However, the bones of a 10,000 year old bear were discovered in a cave near the preserve by Wayne Walker, a local student, and Dr. Philip Greear of Shorter College.

Quarrying of the Conasauga for road stone once threatened the integrity of the Bluff. In an attempt to stop the mining of the area, Dr. Lewis Lipps told the Floyd County Commission that "this small acreage supports an ancient population of rare plants on lime-rich soil, one of two major pockets of mixed mesophytic plants in the area" (the other being the nearby Marshall Forest). She pointed out that the quarry threatened several special plant species in particular, including Dutchman's breeches (*Dicentra cucullaria*), trout lily (*Erythronium americanum*), Jack-in-the-pulpit (*Arisaema triphyllum*), American chestnut (*Castanea dentata*), silverbell (*Halesia carolina*), mock orange (*Philadelphus inodorus*) and arrow-wood (*Viburnum bracteatum).* Dr. Lipps was successful in convincing the commission to stop the mining near the present nature preserve.

In addition to the plants mentioned by Dr. Lipps, there are many others of interest at Black's Bluff. *Scutellaria montana*, the large-flowered skullcap, is a federally endangered species found in several areas of the Bluff. September elm (*Ulmus serotina*), spring coralroot (*Corallorhiza wisteriana*) and wooly lipfern (*Cheilanthes tomentosa*) are found here. Georgia rock cress (*Arabis georgiana*) was discovered here on a Georgia Botanical Society field trip in 1990. On that same field trip, numerous wildflowers were recorded, such as toothwort (*Dentaria multifida, D. laciniata* and *D. diphylla*), hepatica (*Hepatica acutiloba*), bloodroot (*Sanguinaria canadensis*), chickweed (*Stellaria media*, and *S. pubera*), rue anemone (*Thalictrum thalictroides*), blue cohosh (*Caulophyllum thalictroides*), wild blue phlox (*Phlox divaricata*), green violet (*Hybanthus concolor*), early saxifrage (*Saxifraga virginiensis*), long-spurred violet (*Viola rostrata*), pennywort (*Obolaria virginica*), white baneberry (*Actaea pachypoda*), May apple (*Podophyllum peltatum*), phacelia (*Phacelia bipinnatifida*) and spiderwort (*Tradescantia virginiana*). There are over 40 types of trees and a great diversity of shrubs and vines on the hillside, as well.

"This small acreage supports an ancient population of rare plants on lime-rich soil."

During the last few years there has been some confusion about the name of this area. It has been called Black's Bluff, Black Bluff's, Blacks Bluff, Coosa Cliffs and Cliffs of the Coosa. To set the record straight, the site was named after John J. Black, Sr. (1844-1896), who was a tax collector in Rome. He may have lived in the area of the Bluffs although this has not been documented. Since "Black's Bluffs" is hard to pronounce, the locality should properly be known as Black's Bluff.

The Nature Conservancy (TNC) has retained this land as a nature preserve which can be visited by permission (see

directions). There are three primitive trails in the preserve. A new one-half mile-long trail is currently being constructed as a community service project by the Younger Lawyer's Section of the State Bar of Georgia. They are being assisted by members of the Georgia Appalachian Trail Club, members of East Rome High School, and TNC volunteers.

Last year, arsonists set several fires in the preserve. These fires were not very hot, and they probably caused no lasting damage. Some people have even suggested that it will be interesting to see what happens in an area where fire seldom rages. Nonetheless, we were glad to see that the most sensitive and beautiful areas did not burn.

From the preceding paragraphs enumerating the treasures of the Black's Bluff area, one can see that it is a botanical paradise and a truly beautiful place. The many species of wildflowers and trees, the picturesque spring, and massive exposed rocks make Black's Bluff truly unique. Thanks to The Nature Conservancy this area will be preserved for future generations to enjoy.

DIRECTIONS

From I-75 take Georgia highway 20 (Exit 125) west towards Cartersville. Turn north on U.S. 41; in about 3 miles exit onto south U.S. 411. Continue on this road for about 22 miles until you see a Coca-Cola bottling plant on the right. Up ahead, you will see a flashing caution light and a Fina station; turn right. This is Walker Mountain Road; continue for 1.5 miles, then turn right onto Blacks Bluff Road. The preserve is not well-marked, but begins on the right about nine-tenths of a mile from the beginning of the road and stretches for over one-half mile to the rock quarry. You can park in front of the quarry, or at several sites along the road.

Access is by permission only; call The Nature Conservancy at (404) 873-6946. Plants, animals, and other natural features may not be collected or disturbed.

Bookshelf

Gardening with Native Wild Flowers

By Samuel B. Jones Jr. and Leonard E. Foote, Timber Press, Portland, Oregon, 1990. Pp.195, 204 color photographs. Hard cover.

Native plants are enjoying a great spurt of interest in gardens around the county. Just about any "glamour" catalog sells a can of "instant meadow" that purports to be wild. We drive down state highways seeing signs that read: "Do Not Mow, State Wildflower Project" — Texas has become particularly famous for wildflowers down the center of its highways. The only problem is, while many of these flowers have wild origins, where they end up is often a great distance from where they are native. This leads to two potential problems, one practical, one philosophical.

Plants growing away from where they naturally occur often suffer during their lifespan, being placed where they are not adapted. Then there are those of us who know enough about natural flora to bristle, at least a little, when we see a state wildflower plot containing many exotics! So what does all this have to do with Gardening with Wildflowers?

For the very first time, we now have a definitive reference on native southeastern wild plants that will do well in southeastern gardens. Most of the plants in the book can be made comfortable in the home garden if a little attention is paid to the characteristics of their native habitat. If we consider anything to be native that occurs in the southeastern United States, then the philosophical bristle is limited to those to whom native means only those plants that ever at any time grew on the property they call theirs! (What do they do about crabgrass?)

This beautiful book should be considered a last testament by our late friend, Len Foote. He got to see the galley proofs, but not the final product. If you get a copy of this book, treasure the memory of a man who spent much of his life protecting our natural resources. Sam Jones adds the botanical touch, and with the collaboration comes a fine product.

This book will be extremely useful to anyone living in the southeast who wants to use native plant materials.

The bulk of the book is a compendium of species descriptions that Jones and Foote feel should be considered in the home garden. Each includes a brief description (which most of us should already know) followed by the very useful information on culture, habitat and range, flowering season, and propagation. For most entries they comment on the suitable places or uses for the plant in the landscape. Sam Jones notes that one of his favorite native plants in the garden is Indian pink (*Spigelia marilandica*), which is almost guaranteed to elicit comments and compliments from visitors to your garden. While brief and sometimes a little cryptic, these descriptions can form the beginning of a great wildflower garden by bringing to our attention plants that most of us would ignore.

There are chapters to help with propagation, soil preparation, what to grow in the shade, sun and the now-very-popular meadow. For an unusual and intriguing touch, they offer suggestions for using grasses, sedges and rushes even including Fraser's sedge (*Cymophyllus fraseri*), the most unusual sedge from higher elevations in the Smokies. With the growing interest in ponds and wet areas, they also encourage use of aquatic and bog plants.

A big problem with collecting native plants for the garden is finding reliable sources. Most of us consider it unethical to simply go out and dig plants. All of us do it on occasion and usually justify it as a rescue. Many plants can probably be safely gathered from the wild without disturbing their habitat or threatening the health of the species or population, but digging in the wild needs to be discouraged. Many plants are available only from wild sources. Gathering seeds or taking small cuttings from wild plants is far preferable to digging and transplanting. Being very cautious about what to take from the wild is the only way to proceed. Many plants simply will not survive well. Pink lady's slippers (*Cypripedium acaule*) have one of the lowest survival rates of any transplant, so low as to make rescue a problem. It may be best to leave them where they are unless the bulldozer is coming soon (and remember, they are a state protected plant!).

All this concern leads to one of the most useful parts of the book. A long list of commercial sources of native plant materials is included in the back. There is no comment on the ethics of the suppliers, but many will be recognized as among those who care about the natural environment and show it by their practices. Be careful of anyone who offers native orchids and trilliums. If they do, they are usually wild-gathered plants that have been "over-wintered," and the nursery stretches the definition of "propagated" to include this dubious practice. Anyone who has seen the craters where monkeyface orchid (*Platanthera integrilabia*) has been dug on Starr Mountain knows the damage of wild gathering of native plants. So be aware and beware when purchasing wild materials, and use this great book as your guide. There is simply nothing else that does the job as well.

Reviewed by Scott Ranger